

## CLAIMS

1. An automatic toilet room flush valve, comprising:  
a valve body including an inlet and an outlet and a valve seat inside said  
5 body;  
a valve member cooperatively arranged with said valve seat, said valve  
member being constructed and arranged to control water flow between said inlet  
and said outlet, movement of said valve member between open and closed  
positions being controlled by water pressure inside a pilot chamber; and  
10 an external cover designed for enclosing an electronic control module  
comprising a battery, and a sensor, and for enclosing an actuator for controlling  
operation of said flush valve, said external cover including at least two cover  
parts separately removable, said external cover being attachable with respect to  
said valve body in a manner also removably attaching said control module.  
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2. The flush valve of claim 1 wherein constructions of said external cover  
enables separate servicing and replacement of said cover parts.
3. The flush valve of claim 1 wherein said external cover includes said  
20 removable cover parts forming a main cover body, a front cover and a top cover,  
said front cover including a sensor window.
4. The flush valve of claim 3 wherein said main cover body provides  
overall rigidity to said external cover.  
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5. The flush valve of claim 3 wherein said top cover is removable while  
maintaining said front cover including a sensor window located in place with  
respect to said main cover body.
- 30 6. The flush valve of claim 3 wherein said sensor is an optical sensor and  
said sensor window in an optical window.

7. The flush valve of claim 6 further constructed to adjust detection sensitivity of said optical sensor while maintaining said optical window located on said main cover body.

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8. The flush valve of claim 3 wherein said top cover includes at least one side surface designed for facilitating removal of said top cover.

9. The flush valve of claim 3 wherein said top cover is attached with respect to said valve body using at least one screw also providing rigidity to said external cover.

10. The flush valve of claim 9 wherein tightening of said at least one screw attaches said main cover body, said front cover, and said top cover to a pilot cap defining said pilot chamber and being attached to said valve body.

11. The flush valve of claim 3 wherein said top cover includes a button constructed to move between upper and lower positions and designed for manually triggering a flush cycle when pushed to said lower position.

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12. The flush valve of claim 11 further including a removable element designed for shipping and storage, said removable element being positioned to retain said button in said lower position when assembling said top cover.

13. The flush valve of claim 1 wherein said valve member includes a piston.

14. The flush valve of claim 1 wherein said valve member includes a flexible diaphragm.

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15. The flush valve of claim 14 wherein said flexible diaphragm includes a relief passage controlled by said actuator and in communication with said outlet, said flexible diaphragm being retained with respect to said valve body by a pressure cap defining said pilot chamber.

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16. The flush valve of claim 15 including a bypass orifice in said diaphragm connecting said inlet with said pressure chamber, said orifice having a cross section area smaller than that of said relief passage.

10 17. A method for converting a manually operated flush valve used with a urinal or toilet, comprising the acts of:

providing a manually operated flush valve including a flush valve mechanism located within a valve body constructed and arranged to control water flow between a water inlet and a water outlet, a manual handle

15 mechanically coupled to said valve mechanism and constructed to operate said valve mechanism upon pivotable displacement;

closing an external water supply to said valve body;

removing said manual handle and sealing a manual handle port;

removing an external cover above said valve body, said external cover

20 retaining said flush valve mechanism;

attaching to said body an external cover designed for enclosing an electronic control module comprising a battery, and a sensor and enclosing an actuator for controlling operation of said flush valve, said external cover including at least two cover parts separately removable, said external cover being

25 attachable with respect to said valve body in a manner also removably attaching said control module, and

opening said external water supply to enable water flow to said valve body.

18. The method of claim 17 further including adjusting sensitivity of said sensor while maintaining an optical window of said cover in place designed for standard operation.

5           19. The method of claim 17 further including replacing an optical window for said sensor while maintaining in place most of said cover providing overall rigidity.

10           20. A method for servicing an automatic toilet room flush valve comprising the acts of:

          providing an automatic toilet room flush valve including:

              a valve body including an inlet and an outlet and a valve seat inside said body;

15               a valve member cooperatively arranged with said valve seat, said valve member being constructed and arranged to control water flow between said inlet and said outlet, movement of said valve member between open and closed positions being controlled by water pressure inside a pilot chamber; and

20               an external cover designed for enclosing a battery, a sensor and an actuator for controlling operation of said flush valve,

          removing a portion of said external cover while maintaining in place a sensor window included in said external cover, said sensor window being cooperatively arranged with said sensor; and

25               adjusting sensitivity of said sensor while maintaining said sensor window in place designed for regular operation.

          21. The method of claim 20 wherein said sensor window is an optical window, said optical window being replaceable while maintaining in place most of said cover providing overall cover rigidity.

22. A conversion system for converting an installed manually-operated flush valve used with a urinal or toilet, comprising an externally mounted conversion assembly including an alignment member for positioning a control module comprising a microcontroller, a sensor, and a power driver for providing current to a solenoid actuator, said an externally mounted conversion assembly including an external cover for replacing a manual cover of said manually-operated flush valve, said external cover including at least two separately removable parts enabling subsequent servicing.

23. In an automatic toilet flush valve including a body having an inlet and an outlet, a valve assembly in said body constructed and arranged to open and close water flow from said inlet to said outlet upon actuation signals provided by an electronic system to an actuator, said automatic flush valve comprising:

a pressure cap defining a pilot chamber in communication with said output via a relief passage controlled by said actuator;

a sensor, included in said electronic system, constructed to detect a user located in front of said flush valve and designed to provide control signals to said electronic system, said electronic system being constructed to provide drive signals to said actuator; and

a cover mounted above said pressure cap and constructed to provide housing for said electronic system, said cover being designed cooperatively with said electronic system to enable sensitivity adjustment of said sensor without removal of said cover.

24. The automatic flush valve of claim 23 wherein said sensor includes an infrared sensor.

25. The automatic flush valve of claim 23 wherein said sensor includes an ultrasonic sensor.

26. The automatic flush valve of claim 23 wherein said sensor includes a presence sensor.

27. The automatic flush valve of claim 23 wherein said sensor includes  
5 a motion sensor.

28. The automatic flush valve of claim 23 wherein said cover is mounted above said pressure cap.

10 29. The automatic flush valve of claim 23 wherein said valve assembly includes a flexible diaphragm having its periphery fixed relative to said pressure cap, said valve assembly including a vent passage in said flexible diaphragm in communication with said pilot chamber and being controllably sealable by said actuator.

15 30. The automatic flush valve of claim 29 wherein said vent passage includes a flexible member extending between a pilot chamber cap and said vent passage in said flexible diaphragm, said flexible member including a seal remaining stationary during movement of said flexible diaphragm between open  
20 and closed positions of said flush valve.

31. The automatic flush valve of claim 30 wherein said flexible member is a hollow tube.

25 32. The automatic flush valve of claim 31 including a spring positioned within said hollow tube.

33. The automatic flush valve of claim 32 wherein said spring is a coiled wire.

34. The automatic flush valve of claim 23 or 24 wherein said actuator is an isolated actuator.

35. The automatic flush valve of claim 23 or 24 wherein said valve  
5 assembly includes a filter for filtering water passing toward said actuator.

36. The automatic flush valve of claim 32 wherein said filter is attached to said flexible diaphragm.